would be

$$\frac{F}{G}+\frac{P}{Q}=\frac{7x^3-35x^2+55x-27}{(x-1)^2(x-2)(x-3)}=0,$$

from which $7x^3-35x^2+55x-27=0$, or $x=1, 2\pm\frac{1}{7}\sqrt{7}$.

The root $x=1$ is extraneous. The sum of F/G and P/Q is not in its lowest terms. The reason is that $C_1=-B_1$. If the rule stated above is followed, one gets

$$\frac{F}{G}+\frac{P}{Q}=\frac{3}{x-1}+\frac{1}{x-2}+\frac{3}{x-3}=\frac{7x^2-28x+27}{(x-1)(x-2)(x-3)}=0,$$

which yields the true roots $x=2\pm\frac{1}{7}\sqrt{7}$.

II. Determination of an Angle of a Right Triangle, without Tables.

By Roger A. Johnson, Hamline University.

If a, b, c denote respectively the longer leg, the shorter leg, and the hypotenuse, then the value, in degrees, of the smaller acute angle is given approximately by

$$B=172\frac{b}{a+2c}.$$

This formula was given by Ozanam, 1699.

In practice it often happens that all three sides of a right triangle are known, and it is desired to find the angles quickly; the above formula will give them without the use of tables, with almost four-place accuracy for angles up to 35°, and better than three-place accuracy up to 45°. When the sides are given in integers, this method is simpler than the ordinary one. Again, it is useful as a check-formula in testing solutions.

The proof is easily effected by means of Taylor's Series. If we write

$$\frac{b}{a+2c}=\frac{\sin B}{2+\cos B}=f(B),$$

the expansion of $f(B)$ is easily found to be

$$f(B)=\frac{B}{3}\left(1-\frac{1}{180}B^4-\frac{1}{1512}B^6\cdots\right),$$

whence it is evident that for small values of B, $f(B)$ is nearly equal to $\frac{1}{3}B$ radians. That is, if we desire to have B in degrees,

$$B\text{ (degrees)}=\frac{3\times 180}{\pi}f(B)+e,$$

where e is a small correction. We may correct the error in part by replacing the coefficient $540/\pi$, or $171.89\cdots$, by the simpler number 172. The degree of

accuracy is best exhibited by working out the actual value given by the formula for various angles. The subjoined table shows that the angles given by the formula are too large, though the error scarcely exceeds .01 of a degree, up to about 33°; that thereafter the results are too small, and after the angle exceeds 45°, the discrepancy becomes rapidly larger. Since we can always use the formula to compute an angle less than 45°, this later divergence does not affect its usefulness.

True Value.	Value by Formula.	True Value.	Value by Formula.
5°	5.0033	30°	30.0067
10°	10.0065	35°	34.9945
15°	15.0094	40°	39.9703
20°	20.0115	45°	44.9270
25°	25.0112	50°	49.8562

RECENT PUBLICATIONS.

REVIEWS.

General Theory of Polyconic Projections. By OSCAR S. ADAMS, Geodetic Computer. Published by the Department of Commerce, U. S. Coast and Geodetic Survey, Serial No. 110, Special Publication No. 57, Washington, D. C., 1919. 174 pages. Price 25 cents.

To quote from the author's preface, "In this publication an attempt has been made to gather into one volume all of the investigations that apply to the system of polyconic projections." The author gives[1] Tissot's definition of a polyconic projection as "one in which the parallels of latitude are represented by arcs of a non-concentric system of circles with the centers of these various circles lying upon a straight line." Polyconic projections of the sphere and the ellipsoid of revolution only are considered, the whole purpose of the work being the construction of maps of the surface of the earth either as a whole or in part. The table of contents has thirty-one headings: Determination of ellipsoidal expressions, Development of general formulas for polyconic projections, Classification of polyconic projections, Rectangular polyconic projections, Stereographic meridian projection, Derivation of stereographic meridian projection by functions of a complex variable, Construction of stereographic meridian projection, Table for stereographic meridian projection, Stereographic horizon projection, Derivation of stereographic horizon projection by functions of a complex variab e, Proof that circles project into circles in stereographic projections, Construction of stereographic horizon projection, Solution of problems in stereographic projections, Conformal polyconic projections, Determination of the conformal projection in which the meridians and parallels are represented by circular arcs, Special cases of the projection, General study of double circular projections,

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